Use of Tobacco Cessation Aids and Likelihood of Smoking Cessation: a French Population-Based Study

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Introduction

Sustained tobacco cessation is associated with **psychological**, **social** and **environmental** factors ⇒ challenging goal to achieve

Although research suggests that e-cigarettes are safer than traditional cigarettes, the level of **risk reduction** is still being discussed:[1]

(+) Suitable substitute for traditional cigarettes to **avoid nicotine withdrawal symptoms**[2]

(-) **Enhance nicotine dependence**[3] and therefore reduce the odds of successful smoking cessation in the long term

Objective: evaluate effective ways of initiating and maintaining tobacco cessation **in a real-life** rather than an experimental setting

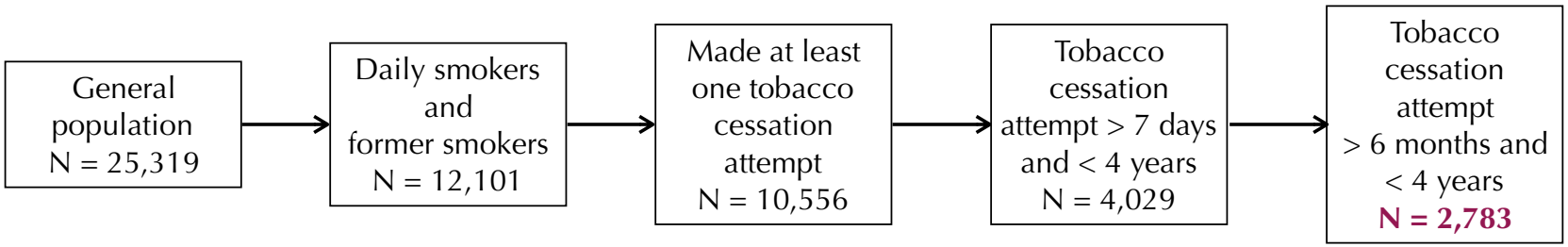
[1] David J K Balfour et al. "Balancing Consideration of the Risks and Benefits of E-Cigarettes". In: *American Journal of Public Health* 111 (9 2021), pp. 1661–1672

[2] J Hartmann-Boyce et al. "Electronic cigarettes for smoking cessation". In: *Cochrane Database of Systematic Reviews* (9 2021)

[3] Ruifeng Chen et al. "Use of Electronic Cigarettes to Aid Long-Term Smoking Cessation in the United States: Prospective Evidence From the PATH Cohort Study". In: *American Journal of Epidemiology* 189 (12 Jan. 2020), pp. 1529–1537

Population

Data: The 2017 **French Health Barometer**, a representative general population telephone survey from Santé publique France



Cessation aid type

(a) e-cigarette

(b) NRT products

(c) Medication

...

***Exposure – Type of tobacco cessation aid used to try to quit smoking*:**[4]

- none (reference)
- e-cigarette
- NRT
- e-cigarette & NRT
- other

[4] R Guignard et al. "Smoking Quit Attempts, Use of Cessation Help, and Smoking Abstinence: a Retrospective Analysis of Santé Publique France Health Barometer 2017". In: *Bull Epidémiol Hebd. 2021;(1):2-11.* (2021)

Tobacco smoking cessation

***Outcome – Tobacco smoking cessation*:**
Three study outcomes corresponding to participants' smoking status **6, 12 and 24 months** after the smoking cessation attempt reported:

- smoker (reference)
- former smoker

The 3 outcomes yielded samples of respectively $N = 2,783$, $N = 1,947$ and $N = 1,079$ participants.

Include covariates

Covariates(X): sex, age, occupational grade, work status, highest level of education, income, etc..

Regression: Weighted logistic regression models controlled for **propensity scores**:[5]

$$\text{PS} = \mathbb{P}(\text{exposure} = \text{“e-cig”}|\mathbf{X}) \tag{1}$$

computed with the Gradient Boosting Machine (GBM) algorithm[6] a nonparametric method allows for complex and non-linear relationship between input variables.

The different exposure groups were quite different $\rightarrow$ we used the **overlap weighting** (OW)[7] instead of the more standard inverse probability weighting (IPW)

[5] Fan Li et al. “Balancing Covariates via Propensity Score Weighting”. In: *Journal of the American Statistical Association* 113 (521 2018), pp. 390–400

[6] Jerome H. Friedman. “Greedy function approximation: A gradient boosting machine.”. In: *The Annals of Statistics* 29.5 (2001), pp. 1189 –1232

[7] Yunji Zhou et al. “Propensity score weighting under limited overlap and model misspecification”. In: *Statistical Methods in Medical Research* 29 (12 2020). PMID: 32693715, pp. 3721–3756

Socio-demographic characteristics

	None	E-cigarette	NRT	E-cig. & NRT	Other	p
N	1716	430	334	95	209	
Age (mean (SD))	39.06 (14.19)	**40.54 (12.33)**	46.78 (13.24)	45.16 (12.80)	41.69 (13.24)	<0.001
Work Status (%)						<0.001
Employed	1051 (61)	**298 (69)**	196 (59)	68 (72)	138 (66)	
Student	121 (7)	23 (5)	8 (3)	1 (1)	17 (8)	
Out-of the labour force	395 (23)	81 (19)	71 (21)	21 (22)	33 (16)	
Retired	148 (9)	27 (6)	59 (18)	4 (5)	22 (10)	
Occupational grade (%)						0.136
Worker	421 (25)	84 (20)	84 (25)	30 (31)	43 (21)	
Supervisor/office employee	828 (48)	**226 (53)**	146 (44)	44 (46)	105 (50)	
Executive	166 (10)	57 (13)	54 (16)	7 (7)	27 (13)	
Other	27 (2)	7 (2)	1 (0)	0 (0)	4 (2)	
Not working	274 (16)	55 (13)	48 (15)	14 (15)	29 (14)	
Income (%)						<0.001
1st tercile	801 (47)	147 (34)	123 (37)	37 (39)	69 (33)	
2nd tercile	545 (32)	**161 (37)**	121 (36)	33 (35)	75 (36)	
3rd tercile	370 (22)	**122 (28)**	90 (27)	24 (26)	65 (31)	
Relationship status = Single (%)	1085 (63)	246 (57)	175 (52)	55 (58)	126 (60)	0.017

All headcounts and percentages were weighted by margin calibration.

Behavioral and health-related characteristics

	None	E-cigarette	NRT	E-cig. & NRT	Other	p
Negative life event = yes (%)	729 (42)	198 (46)	172 (52)	52 (55)	92 (44)	0.040
Physical activity* (%)						0.046
Never	507 (30)	126 (29)	130 (39)	26 (27)	54 (26)	
Monthly/annually	218 (13)	52 (12)	48 (14)	19 (20)	33 (16)	
Weekly	990 (58)	**252 (59)**	156 (47)	50 (53)	122 (58)	
Chronic disease* = yes (%)	547 (32)	163 (38)	151 (45)	52 (55)	72 (34)	<0.001
Psychotropic medication = yes (%)	613 (36)	180 (42)	178 (53)	47 (49)	99 (47)	<0.001
Social support* (%)						0.020
Below 3	419 (24)	73 (17)	77 (23)	30 (32)	40 (19)	
3 to 5 people	686 (40)	199 (46)	149 (45)	38 (40)	108 (52)	
6 and above	610 (36)	**158 (37)**	109 (33)	27 (28)	61 (29)	

*All headcounts and percentages were weighted by margin calibration. *Imputed with mice*

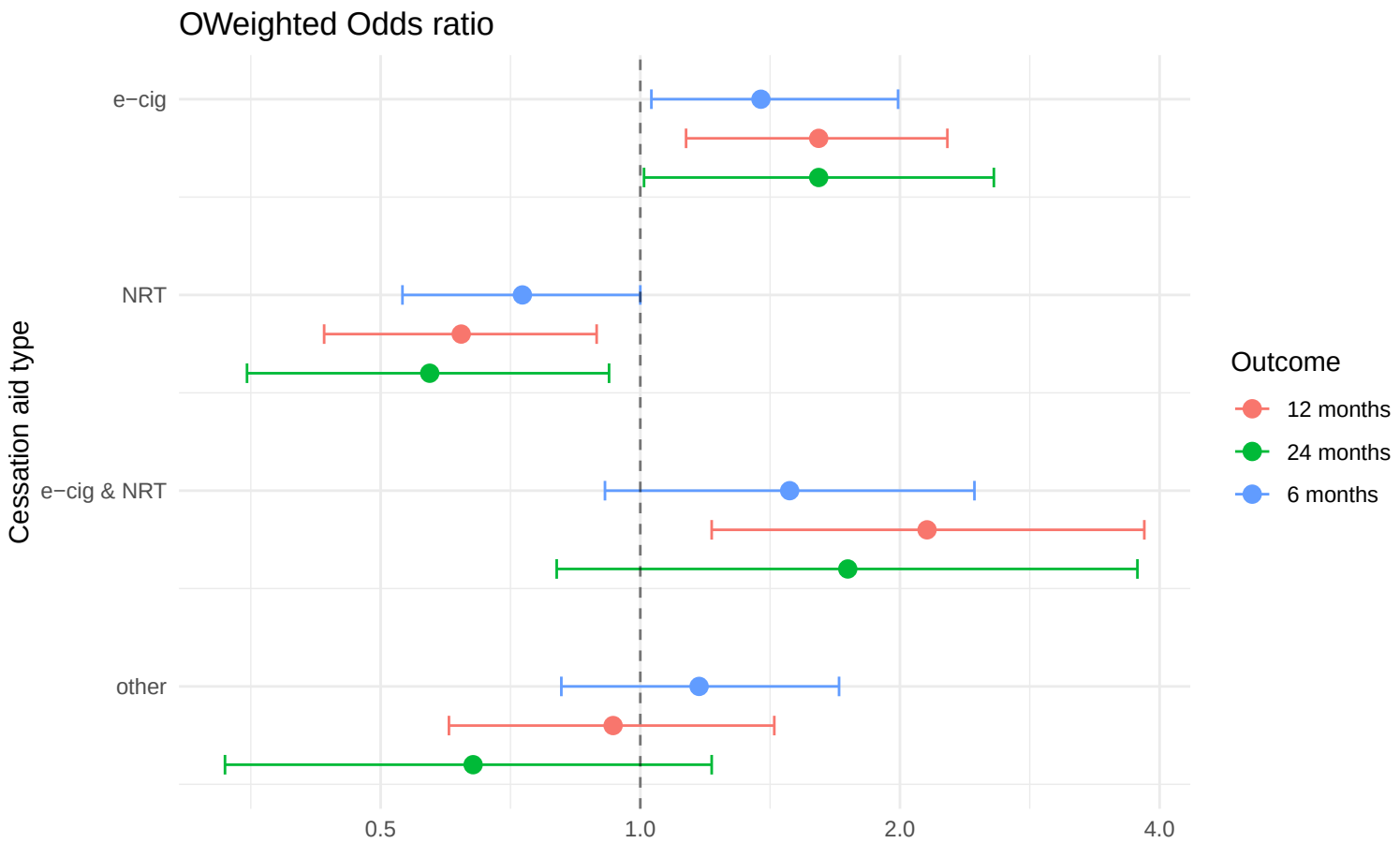
Tobacco-related characteristics

	None	E-cigarette	NRT	E-cig. & NRT	Other	p
Age of regular smoking initiation* (mean (SD))	19.36 (4.67)	**18.56 (4.26)**	19.25 (4.73)	18.81 (3.59)	18.67 (3.78)	0.020
Nb quit attempts* (mean (SD))	3.60 (8.19)	3.81 (7.04)	3.75 (7.81)	5.12 (5.75)	3.55 (4.68)	0.151
Cessation type* = Progressive (%)	398 (23)	**137 (32)**	90 (27)	31 (33)	41 (20)	0.005
Smoking status = Former smoker (%)	573 (33)	**188 (44)**	100 (30)	44 (47)	82 (39)	0.001

*All headcounts and percentages were weighted by margin calibration. *Imputed with mice*

Regression results

Tobacco cessation – 0: smoker (ref.),1: former smoker



Discussion

Main findings – While e-cigarette use is associated with both **short and medium-term** transition from being a smoker to being a former smoker, its protective effect on a **longer-term** remains **uncertain**.

Strengths and limitations –

(-) retrospective assessment → recall bias (limit to 4 years preceding the survey)

(-) conducted in 2017 and smoking patterns may have somewhat changed since

(-) could not control for the level of tobacco consumption because of the survey design

(+) nationally representative sample of the French population

(+) conducted in real life conditions → easier to generalize

(+) using a recent method, the overlap weighting, that helps leaning towards a study design in which exposure is more randomized

Findings' interpretation

The use of an **e-cigarette** → associated with tobacco cessation, while this does not appear to be the case for **exclusive NRT** use in our sample.

Possible explanations –

1) vaping resembles smoking and might therefore reduce the need to smoke tobacco while maintaining a somewhat familiar gesture
2) smokers tend to under-report their tobacco consumption → under-dosed NRT prescription, while vapers are able to adjust their nicotine intake more easily
3) NRT users are heavier smokers than e-cigarette users → not controlling for heaviness of smoking might lead to stronger residual confounding for NRT users
4) compliance with NRT prescription is not always guaranteed

Conclusion – Other effective ways to increase the likelihood of long-term smoking abstinence include **behavioral counselling** and **financial incentives**[8] ⇒ combine **counselling** with **self-help approaches** whenever possible.

[8] Ivan Berlin et al. "Financial incentives for smoking cessation in pregnancy: multicentre randomised controlled trial". In: *BMJ* 375 (Dec. 2021), e065217